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Dogs Chest Homogeneous Phantom for Image Optimization

Authors : Maris Eugênia Dela Rosa, Ana Luiza Menegatti Pavan, Marcela De Oliveira, Diana Rodrigues De Pina, Luis Carlos Vulcano

Abstract : In medical veterinary as well as in human medicine, radiological study is essential for a safe diagnosis in clinical practice. Thus, the quality of radiographic image is crucial. In last year's there has been an increasing substitution of image acquisition screen-film systems for computed radiology equipment (CR) without technical charts adequacy. Furthermore, to carry out a radiographic examination in veterinary patient is required human assistance for restraint this, which can compromise image quality by generating dose increasing to the animal, for Occupationally Exposed and also the increased cost to the institution. The image optimization procedure and construction of radiographic techniques are performed with the use of homogeneous phantoms. In this study, we sought to develop a homogeneous phantom of canine chest to be applied to the optimization of these images for the CR system. In carrying out the simulator was created a database with retrospectives chest images of computed tomography (CT) of the Veterinary Hospital of the Faculty of Veterinary Medicine and Animal Science - UNESP (FMVZ / Botucatu). Images were divided into four groups according to the animal weight employing classification by sizes proposed by Hoskins & Goldston. The thickness of biological tissues were quantified in a 80 animals, separated in groups of 20 animals according to their weights: (S) Small - equal to or less than 9.0 kg, (M) Medium - between 9.0 and 23.0 kg, (L) Large – between 23.1 and 40.0kg and (G) Giant – over 40.1 kg. Mean weight for group (S) was 6.5±2.0 kg, (M) 15.0±5.0 kg, (L) 32.0±5.5 kg and (G) 50.0 ±12.0 kg. An algorithm was developed in Matlab in order to classify and quantify biological tissues present in CT images and convert them in simulator materials. To classify tissues presents, the membership functions were created from the retrospective CT scans according to the type of tissue (adipose, muscle, bone trabecular or cortical and lung tissue). After conversion of the biologic tissue thickness in equivalent material thicknesses (acrylic simulating soft tissues, bone tissues simulated by aluminum and air to the lung) were obtained four different homogeneous phantoms, with (S) 5 cm of acrylic, 0,14 cm of aluminum and 1,8 cm of air; (M) 8,7 cm of acrylic, 0,2 cm of aluminum and 2,4 cm of air; (L) 10,6 cm of acrylic, 0,27 cm of aluminum and 3,1 cm of air and (G) 14,8 cm of acrylic, 0,33 cm of aluminum and 3,8 cm of air. The developed canine homogeneous phantom is a practical tool, which will be employed in future, works to optimize veterinary X-ray procedures.

Keywords : radiation protection, phantom, veterinary radiology, computed radiography
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